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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Wang et al.

Attorney Docket No.: KLA1P099/P1085

Patent: 6,924,484 B1

Issued: August 2, 2005

Title: VOID CHARACTERIZATION IN METAL INTERCONNECT STRUCTURES USING X-REAY EMISSION ANALYSES

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as first class mail on September 7, 2005 in an envelope addressed to the Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450.

Signed: _____

Aurelia M. Sanchez

REQUEST FOR CERTIFICATE OF CORRECTION OF OFFICE MISTAKE (35 U.S.C. §254, 37 CFR §1.322)

Certificate

SEP 15 2005

of Correction

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450
Attn: Certificate of Correction

Dear Sir:

Attached is Form PTO-1050 (Certificate of Correction) at least one copy of which is suitable for printing. The errors together with the exact page and line number where the errors are shown correctly in the application file are as follows:

SPECIFICATION:

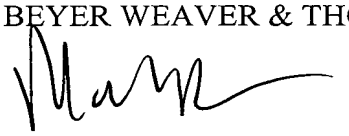
1. Column 7, lines 66-67, change "suicides and low k" to --silicides and low k--. This appears correctly in the patent application as filed on October 22, 2003, on page 13, line 5.

SEP 14 2005

Patentee hereby requests expedited issuance of the Certificate of Correction because the error lies with the Office and because the error is clearly disclosed in the records of the Office. As required for expedited issuance, enclosed is documentation that unequivocally supports the patentee's assertion without needing reference to the patent file wrapper.

It is noted that the above-identified errors were printing errors that apparently occurred during the printing process. Accordingly, it is believed that no fees are due in connection with the filing of this Request for Certificate of Correction. However, if it is determined that any fees are due, the Commissioner is hereby authorized to charge such fees to Deposit Account 500388 (Order No. KLA1P099).

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP



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within an integrated circuit. A description of how to analyze and characterize different types of voids in copper integrated circuits will be discussed in detail further below.

In alternative embodiments, one can analyze voids in structures composed of other metals such as aluminum, tungsten, tantalum, titanium and chromium, as well as non-metals such as silicon, silicon dioxide, polyimide, silicides and low k insulation materials. In other embodiments, other potentially defective areas such as physical shorts, particles or chemical impurities can be analyzed and characterized. In other embodiments, the present techniques can be used to analyze the localized film thickness variations of one or more layers of material in a film stack. For example, the present techniques can be used to analyze the presence of and amount of dishing and erosion phenomenon occurring as a result of imperfect CMP processes on metal films.

CHARACTERIZING VOIDS IN COPPER INTERCONNECTS

As discussed previously, the emission of Cu K and Cu L from copper can be used to characterize different depths of a copper-containing sample. This characterization of copper material with respect to depth can be used to detect the presence of voids and to characterize the qualities, locations and sizes of the voids. Some techniques for doing this are described below.

Void characterization of Cu interconnect structure can primarily be based on the following emissions: low energy Cu Lα X-rays, high energy Cu Kα X-rays and Si Kα X-rays. As described previously, the low energy Cu Lα X-rays are most strongly detected when they are emitted from the sample surface or upper portion of the sample and decrease dramatically when emitted from deeper regions of the sample. The high energy Cu Kα X-rays are strongly detected when they are emitted from the sample surface and also when they are emitted from deeper bulk portions of the sample.

So if a void were to exist near the sample surface, there is less copper material near the sample surface to emit both Cu Lα X-ray and Cu Kα X-rays. However, the relative amount of Cu Lα X-ray emission will decrease more than the amount of Cu Kα X-ray emission. Likewise, if a void were to exist in the deeper portions of the sample, there is less copper material in the deeper portions of the sample to emit both types of X-rays. In this case, there are already only small amounts of Cu Lα X-ray emission and the relative decrease of the Cu Kα X-ray emission is more dramatic. So detection of Cu Lα X-rays may

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CERTIFICATE OF CORRECTION

PATENT NO. : 6,924,484 B1

DATED : August 2, 2005

INVENTOR(S) : Wang et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Specifications:

Column 7, lines 66-67, "suicides and low k" should be --silicides and low k--.

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